removable by hand without the use of tools. If attachment of the cover is by formed screw threads, it shall be of such construction or material to prevent rusting or corrosion and will not back off and loosen under shipboard vibration.

(d) *Performance.* Signals shall meet all the inspection and test requirements contained in §160.022–4.

§160.022–4 Approval and production tests.

(a) *Approval tests.* The manufacturer must produce a lot of at least 100 signals from which samples must be taken for testing for approval under §160.022–7. The approval tests are the operational tests and technical tests in paragraphs (c) and (d) of this section. The approval tests must be conducted by an independent laboratory accepted by the Commandant under §159.010 of this chapter.

(b) *Production inspections and tests.* Production inspections and tests of each lot of signals produced must be conducted under the procedures in §159.007 of this chapter. Signals from a rejected lot must not be represented as meeting this subpart or as being approved by the Coast Guard. If the manufacturer identifies the cause of the rejection of a lot of signals, the signals in the lot may be reworked by the manufacturer to correct the problem. Samples from the rejected lot must be retested in order to be accepted. Records shall be kept of the reasons for rejection, the reworking performed on the rejected lot, and the results of the second test.

(1) *Lot size.* For the purposes of sampling the production of signals, a lot must consist of not more than 30,000 signals. Lots must be numbered serially by the manufacturer. A new lot must be started with:

(i) Any change in construction details,

(ii) Any change in sources of raw materials, or

(iii) The start of production on a new production line or on a previously discontinued production line.

(2) *Inspections and tests by the manufacturer.* The manufacturer's quality control procedures must include inspection of materials entering into construction of the signals and inspection of the finished signals, to determine that signals are being produced in accordance with the approved plans. Samples from each lot must be tested in accordance with the operational tests in paragraph (c) of this section.

(3) *Inspections and tests by an independent laboratory.* An independent laboratory accepted by the Commandant under §159.010 of this chapter must perform or supervise the inspections and tests under paragraph (b)(2) of this section at least 4 times a year, unless the number of lots produced in a year is less than four. The inspections and tests must occur at least once during each quarterly period, unless no lots are produced during that period. If less than four lots are produced, the laboratory must perform or supervise the inspection and testing of each lot. In addition, the laboratory must perform or supervise the technical tests in paragraph (d) of this section at least once for every ten lots of signals produced, except that the number of technical tests must be at least one but not more than four per year. If a lot of signals tested by the independent laboratory is rejected, the laboratory must perform or supervise the inspections and tests of the reworked lot and the next lot of signals produced. The tests of each reworked lot and the next lot of signals must not be counted for the purpose of meeting the requirement for the annual number of inspections and tests performed or supervised by the independent laboratory.

(c) *Operational tests.* Each lot of signals must be sampled and tested as follows:

(1) *Sampling procedure and accept/reject criteria.* A sample of signals must be selected at random from the lot. The size of the sample must be the individual sample size in Table 160.022–4(c)(1) corresponding to the lot size. Each signal in the sample is tested as prescribed in the test procedure in paragraph (c)(2) of this section. Each signal that has a defect listed in the table of defects (Table 160.022–4(c)(2)) is assigned a score (failure percent) in accordance with that table. In the case of multiple defects, only the score having the highest numerical value is assigned

to that signal. If the sum of all the failure percents (cumulative failure percent) for the number of units in the sample is less than or equal to the accept criterion, the lot is accepted. If this sum is equal to or more than the reject criterion the lot is rejected. If the cumulative failure percent falls between the accept and reject criteria, another sample is selected from the production lot and the operational tests are repeated. The cumulative failure percent of each sample tested is added to that of the previous samples to obtain the cumulative failure percent for all the signals tested (cumulative sample size). Additional samples are tested and the tests repeated until either the accept or reject criterion for the cumulative sample size is met. If any signal in the sample explodes when fired or ignited in a way that could burn or otherwise injure the person firing it, the lot is rejected without further testing. (This procedure is diagrammed in figure 160.022–4(c).)

(2) *Test Procedure.* Each sample signal (specimen) must be tested as follows:

(i) *Conditioning of test specimens—water-resistance.* Immerse specimens horizontally with uppermost portion of the signal approximately 25 mm (1 in.) below the surface of the water for a period of 24 hours.

(ii) *Smoke emitting time.* Ignite specimen according to the directions printed on the signal and place signal in tub or barrel of water. The smoke emitting time of a specimen shall be obtained by stop watch measurements from the time of distinct, sustained smoke emission until it ceases. The watch shall be stopped during periods of flame emission. The smoke emitting time for a specimen shall be not less than 4 minutes.

(iii) *Ignition and smoke emitting characteristics.* Test specimens shall ignite and emit smoke properly when the directions on the signal are followed. Test specimens shall not ignite explosively in a manner that might be dangerous to the user or persons close by. Test specimens shall emit smoke at a uniform rate while floating in calm to rough water. Signals should be so constructed that water submerging the signal in moderately heavy seas will not cause it to become inoperative.

TABLE 160.022–4(C)(1)—ACCEPT AND REJECT CRITERIA FOR OPERATIONAL TEST LOTS.

Lot size	Individual sample size	Sample	Cumulative sample size	Accept [1]	Reject [1]
280 or less.	8	First	8	([2])	400
		Second	16	100	500
		Third	24	200	600
		Fourth	32	300	700
		Fifth	40	500	800
		Sixth	48	700	900
		Seventh	56	950	951
281 to 500.	13	First	13	0	400
		Second	26	100	600
		Third	39	300	800
		Fourth	52	500	1,000
		Fifth	65	700	1,100
		Sixth	78	1,000	1,200
		Seventh	91	1,350	1,351
501 to 1,200.	20	First	20	0	500
		Second	40	300	800
		Third	60	600	1,000
		Fourth	80	800	1,300
		Fifth	100	1,100	1,500
		Sixth	120	1,400	1,700
		Seventh	140	1,850	1,851
1,201 to 3,200.	32	First	32	100	700
		Second	64	400	1,000
		Third	96	800	1,300
		Fourth	128	1,200	1,700
		Fifth	160	1,700	2,000
		Sixth	192	2,100	2,300
		Seventh	224	2,550	2,551
More than 3,201.	50	First	50	200	900
		Second	100	700	1,400
		Third	150	1,300	1,900
		Fourth	200	1,900	2,500
		Fifth	250	2,500	2,900
		Sixth	300	3,100	3,300
		Seventh	350	3,750	3,751

[1] Cumulative failure percent.
[2] Lot may not be accepted. Next sample must be tested.

TABLE 160.022–4(C)(2)

Kind of defects	Percentage of failure
a. Failure to ignite	100
b. Ignites or burns dangerously	50
c. Nonuniform smoke emitting rate	50
d. Smoke-emitting time less than 70 pct of specified time	100
e. Smoke-emitting time at least 70 pct but less than 30 pct of specified time	75
f. Smoke-emitting time at least 80 pct but less than 90 pct of specified time	50
g. Smoke-emitting time at least 90 pct but less than 100 pct of specified time	25

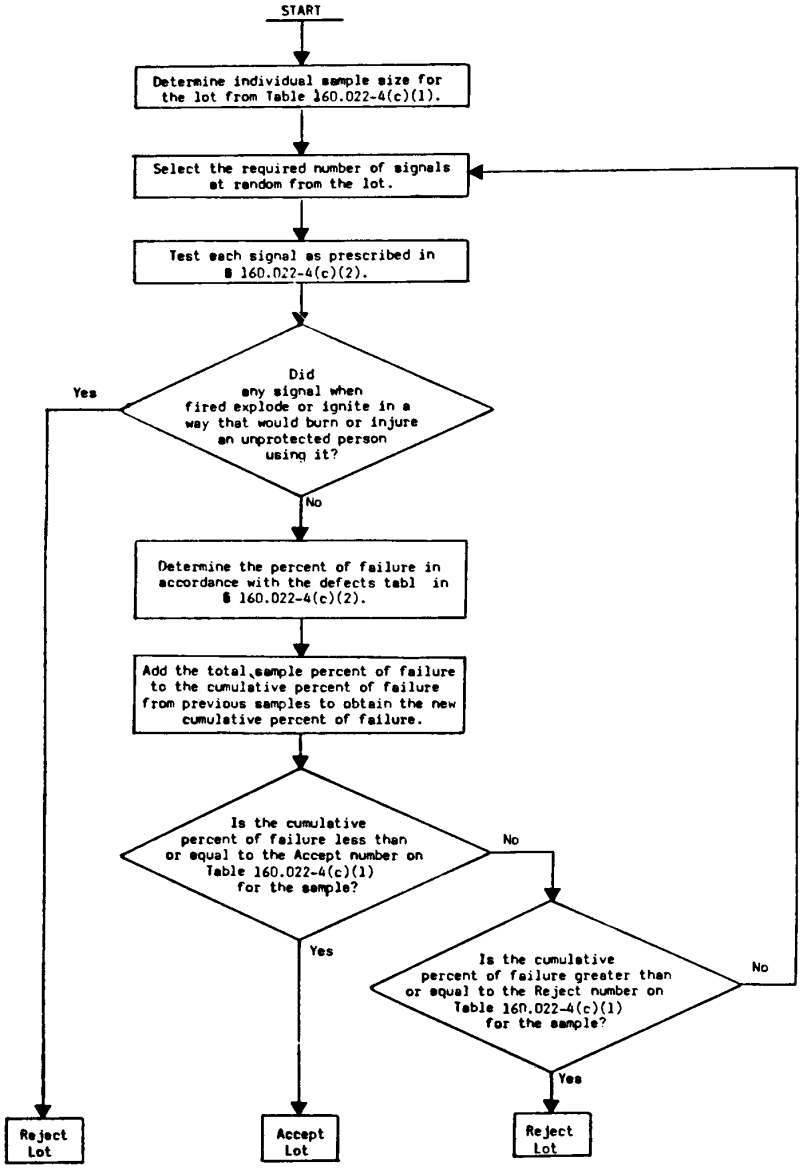

Figure 160.022-4(c). Operational test procedure.

(d) *Technical tests.* Three signals must be subjected to each of the following tests. Two of the three signals must pass the test in order for the lot of signals to be accepted.

(1) *Smoke emission in waves.* The signal shall be ignited and thrown overboard under conditions where the waves are at least 30 cm (1 ft.) high. The smoke emitting time must be at least 4 minutes and the signal shall float in such a manner that the signal shall function properly during this test. Failure to pass this test shall be cause for the lot to be rejected.

(2) *Underwater smoke emission.* Condition each sample in accordance with paragraph (c)(2)(i) of this section. Ignite specimen and let it burn about 15 seconds in air. Submerge the burning signal in water in a vertical position with head down. Obtain underwater smoke emission time by stop watch measurements from time of submersion until distinct, sustained smoke emission ceases. The test specimen shall emit smoke underwater not less than 15 seconds when subjected to this test.

(3) *Elevated temperature, humidity, and storage.* Place specimen in a thermostatically controlled even-temperature oven held at 75 °C. with not less than 90 percent relative humidity for 72 hours. Remove specimen and store at room temperature (20° to 25 °C.) with approximately 65 percent relative humidity for ten days. If for any reason it is not possible to operate the oven continuously for the 72-hour period, it may be operated at the required temperature and humidity for 8 hours out of each 24 during 72-hour conditioning period. (Total of 24 hours on and 48 hours off). The signal shall not ignite or decompose during this conditioning. The signal shall ignite and operate satisfactorily following this conditioning.

(4) *Spontaneous ignition.* Place the specimen in a thermostatically controlled even-temperature oven held at 75 °C. with not more than 10% relative humidity for 48 consecutive hours. The signal shall not ignite or undergo marked decomposition.

(5) *Susceptibility to explosion.* Remove smoke composition from signal and punch a small hole in the composition. Insert a No. 6 commercial blasting cap. Ignite the cap. The test specimen shall not explode or ignite.

(6) *Corrosion resistance.* Expose the complete specimen with cover secured hand-tight to a finely divided spray of 20 percent by weight sodium chloride solution at a temperature between 32 °C and 38 °C (90 °F and 100 °F) for 100 hours. The container and cap must not be corroded in any fashion that would impair their proper functioning.

(7) *Color of smoke.* Ignite specimen in the open air in daytime according to the directions printed on the signal, and determine the smoke color by direct visual comparison of the unshadowed portions of the smoke with a color chart held so as to receive the same daylight illumination as the unshadowed portions of the smoke. The color of the smoke must be orange as defined by Sections 13 and 14 of the ''Color Names Dictionary'' (colors 34–39 and 48–54).

(8) *Volume and density of smoke.* The test specimen shall show less than 20 percent transmission for not less than 3 minutes when measured with apparatus having a light path of 19 cm (7½ in.), an optical system aperture of +3.7 degrees, and an entrance air flow of 18.4m^3 per minute (650 cu. ft. per minute), such apparatus to be as described in National Bureau of Standards Report No. 4792.

§ 160.022–5 Marking.

(a) *Directions for use.* Each floating orange smoke distress signal shall be plainly and indelibly marked in black lettering not less than 3 mm (⅛ in.) high ''Approved for daytime use only'', and in black lettering not less than 5 mm (3⁄16 in.) high with the word ''Directions''. Immediately below shall be similarly marked in black lettering not less than 3 mm (⅛ in.) high: ''1. Use Only When Aircraft or Vessel Is Sighted''. Then in numbered paragraphs, in similar lettering, there shall follow in simply and easily understood wording, instructions to be followed to make the device operative. Pasted-on labels are not acceptable.

(b) *Other markings.* (1) There shall be embossed or die-stamped, in the outer container in figures not less than 5 mm (3⁄16 in.) high, numbers, indicating the month and year of manufacture, thus: ''6–54'' indicating June 1954. The outer container shall also be plainly and indelibly marked with the commercial designation of the signal, the words